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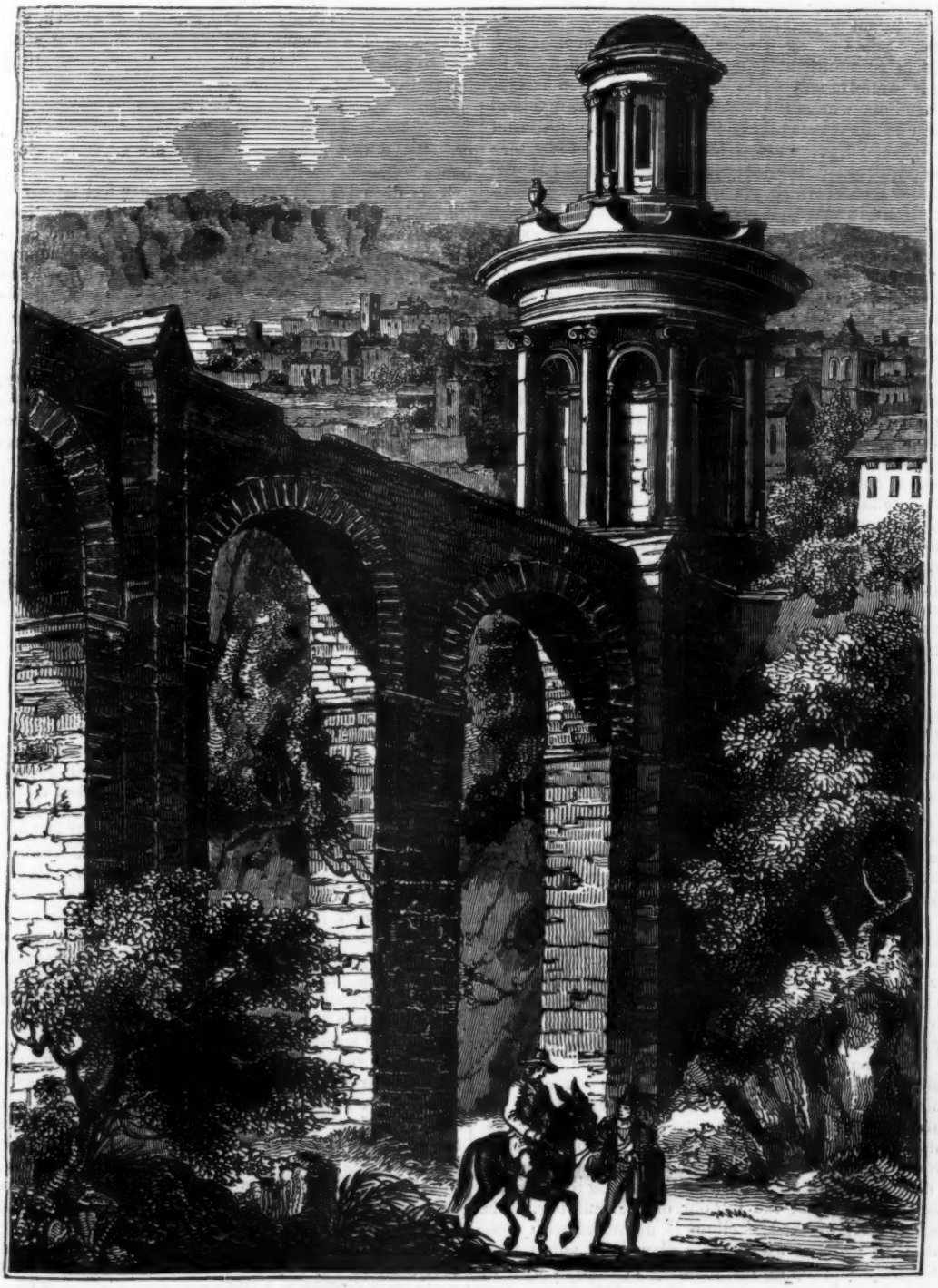
ROMAN AQUEDUCT AND CASTELLUM AT EVORA, IN PORTUGAL.



[Roman Aqueduct and Castellum at Evora.]

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We recently gave our readers a view and a short description of the beautiful Temple of Diana at Evora, and we now present them with some more interesting antiquities which exist at the same place.

Our engraving represents a portion of the fine old Roman aqueduct, terminating towards the town with a circular castellum. These castella or castles answered more than one purpose. In the long water-courses and successions of aqueducts that supplied ancient Rome, they were erected at certain distances from each other as lodging places for soldiers, who were charged with the protection and guard of the important works; and hence, in all probability, they derived their military name. Some of them were occupied by masons and builders constantly at hand to keep the aqueducts in repair, while others again merely served as fountains or conduits where the water could be procured and drawn off by means of pipes and cocks. In this latter sense, the old grey-stone building that used to be seen some years ago in the Pentonville fields near to White-Conduit House, which place of entertainment took its name from it, was once a castellum, or, as we call it, a *conduit*, a term that equally implied an aqueduct or the pipe or cock at which water was drawn off. The tower at Evora is also a castellum of this sort. In the interior of it there is a reservoir to hold part of the water conveyed across the arches; and some pipes emit this water on the spot, whilst other tubes carried under ground convey the fluid to different fountains and cisterns within the town. In too many instances in Spain, Portugal, Italy, Dalmatia, and other countries where the ancient Romans left almost imperishable evidences of their sway, in the stupendous buildings they erected, works of similar public utility have been suffered to go to decay and become useless; but here both aqueduct and castellum are well preserved, and as useful as ever; and the modern inhabitants of Evora still drink the wholesome water that was brought to the place by art and industry some eighteen hundred years ago. The aqueduct is built of stone mixed with hard marble-like mortar or cement. The castellum is most neatly constructed of brick, and coated over with the almost imperishable Roman tonica or plaster. These ancient bricks are altogether different from ours. They are flat like paving-tiles, seldom more than two inches thick, and as hard and as thoroughly baked as the solid clayey substance called terra-cotta. They are laid down horizontally, or on their flat sides, and the cement or mortar placed between them binds them together with wonderful strength and compactness. Walls and even vaulted roofs composed of these materials are frequently found in the most perfect state of preservation, when the parts of the same or some contiguous ancient edifice that were built of stone are mouldering away or in ruins. The fragility—the perishableness which attaches to most of our modern brick buildings has nothing in common with the ancient Roman walls of brick, to the quality of which, in a country where stone and marble are scarce, our builders and architects would do well to turn their attention. The walls of the castellum at Evora are as perfect as if they were built yesterday, and indeed much stronger, for the cement hardens with time.

The plan of this building, which will be better understood from our engraving than from words, is circular: its greatest circumference, not embracing the surrounding columns, is thirty-eight feet. The columns, which are eight in number, are of the Ionic order. In each intercolumniation there is a niche; and a door in one of these niches gives access to the reservoir of water and the interior of the building. The second story of the Castellum is decorated with Ionic pilasters, between which are apertures to admit light and air. The top of the building is covered with an hemispherical dome.

There is another and more modern object at Evora which generally attracts the traveller's notice, and which is considered by many of the natives as far more curious than their Roman antiquities. When Mr. Murphy was there about half a century ago, and busily employed in making drawings of the temple and aqueduct, he was asked whether he had seen that wonder of Portugal, the human-bone or charnel-house in the Franciscan Monastery. On replying that he had not, his interlocutor, with the pride of a Cicerone, said, "Well then, Mr. Stranger, you have seen nothing! so come along with me." Murphy went; and after passing through the body of the Franciscan church, was ushered into a gloomy, horrible vault, over the archway of which he read the following somewhat startling inscription:—

"Nos os ossos que aqui estamos
Pellos vossos esperamos;"

or,—"We whose bones are here are expecting your bones."

This dismal apartment is about sixty feet long and thirty-six wide. On each side of the nave are four large, broad piers, and all the eight piers are completely covered over with grinning skulls and human bones, which are fastened upon them with a hard and rough stucco. Such exhibitions of the miserable remains of mortality are repugnant to our feelings; and they produce no soberness of thought or salutary awe, being visited merely as curious shows.

Evora is about eighty English miles from Lisbon, lying a little to the south of the high road from that capital to Badajoz and Madrid. Besides several Roman remains, some interesting Celtic ruins and altars are found in the neighbourhood of this ancient city.

WINE.

[From a Correspondent.]

Various causes concur in producing that tendency to excess in drink, which is unfortunately so prevalent. Among them may, perhaps, be reckoned the laborious and close application, in some form or other, of almost all classes in this country, whether directly engaged in business or not; the gradual extinction of what may be called "the amusements of the people;" the nature of our climate, unfavourable to out-door relaxation; the scanty supply of cheap fruit, except for a short season in summer, &c. &c. It is by no means meant to be insinuated that industry is an evil, or that popular amusements and the like are unmixed good, but merely (to use a comparison) that the bow long drawn to the head of the shaft is too liable to relax itself violently in the opposite direction. Ardent spirit is thus resorted to as a cheap and ready stimulant, when any thing in the shape of indulgence is permitted. A comparatively small quantity of such liquor soon affects the head; perhaps the drinker sat down without any intention of being guilty of excess, but, self-command being gone, drunkenness, with all its distressing consequences, ensues, and eventually these coarse stimulants are found to amount to a higher price, in time and money, than even choice wines.

Going a step higher, and looking round among that class which consumes Spanish and Portuguese *wines* (as they are called), though the scenes of 'Gin Lane' may not indeed be witnessed, yet both the head and the health are too often affected. The reason is obvious. A few glasses only of those wines (as they come to us), from the quantity of brandy contained in them, produce an unwholesome excitement, which leads to injurious consequences.

It is manifest that temperance societies, however excellent, do not reach the seat of the evil. Akin to them in principle, a *counteracting* measure may be re-

commended as apparently of much importance, though hitherto almost wholly neglected by the friends of national sobriety. This measure is,—the substitution of a light, cheap, and pleasant beverage for the odious drinks so common in this country. People of all classes will consume fermented liquor of some kind. Everywhere drinking, of one description or other, is always associated with holiday-making, and with relaxation generally. No valid reason, indeed, can be produced against the use of a jug of wine any more than against making a hearty meal on roast beef. Each admits equally of abuse, as well as every other bounty of Providence, and both must be reckoned in the class of luxuries, not in that of necessaries. The overloading of the stomach, or the intoxication of the brain, are the evils to be deprecated, not the moderately liberal use. It is even desirable, for obvious reasons, that the enjoyment of wholesome and pleasant drink, in moderation, should be extended to all classes of society. There can be no impropriety in referring on this occasion to the many passages of Scripture in which the use of wine is spoken of with approbation, while its abuse is reprobated. Our nation having, from various causes, (the hereditary quarrels with France, a principal one,) been almost forced into the use of liquors which contain much alcohol, a small quantity of any of them affects the head (as above indicated), and thus persons become inebriated without being aware of their danger. It is quite unfair to say, that we are resolved to get drunk on something, and to contrast us with other nations in this respect. Livy and other ancient writers describe the Gauls, the ancestors of the modern French, as being much given to intoxication; as eagerly buying wine of the Italians at any price within their reach,—not excepting that of selling their children in order to procure the beastly gratification. This was before the vine was cultivated in France. The Italian dealers most probably brought heady wines, with a view to take advantage of the drunken moments of their customers. The French of our day, having at hand a light beverage procured from their own vineyards, are, and their nation long has been, eminent for sobriety. The progress of civilization, it is true, must not be lost sight of in the account, yet the uncounteracted tendency of the people is not the less observable. The South Sea Islanders, again, notwithstanding their exquisite climate, and many other advantages, fall into shameful intoxication when they can obtain ardent spirits. Every one who has spent much time in the wine countries of Europe must have observed that intoxication is very rare there, and at the same time that the inhabitants consume a good deal of wine. These two conditions are perfectly compatible. The wine drunk in those districts is indeed "wine,"—not the "liquid fire" sent to us from Spain, Portugal, and Madeira. The Spaniards and Portuguese, nations proverbial for sobriety, would not themselves touch the wine prepared by them for the English market,—a preparation adapted to a factitious taste.

Since, then, it is neither possible nor desirable wholly to dispense with fermented liquors, it becomes an object of no slight importance to place before consumers of all classes, or before as many as possible, a beverage at once palatable, light and cheap,—a pleasing but safe stimulant. Such a beverage offers itself in the commoner wines of France, Spain, Italy and Germany. It may be objected that the national taste is not inclined to such drink, and that it is altogether ridiculous to think of wine becoming an article for the consumption of working people. To this it may be answered, that our forefathers used and liked wine resembling that here recommended; and that there appears to be no reason why a labourer should not drink and relish wine as well as his employer. The labourers in wine countries drink nothing else. Should agreeable light wine ever be rendered accessible to the artizan, he will not be long in preferring it to gin or grog. There certainly is no natural antipathy in mankind to the juice of the grape, or sympathy with that obtained through the barley-corn. All such tastes may be both introduced and supplanted. Witness the introduction of potatoes, porter, ginger-beer, &c. Tea is an instance strikingly in point. No article of consumption was ever more opposed at first (and that too by men of eminent virtue and ability), or at one time seemed less likely to come into general use. Every one is aware that it contains no nutriment; yet, from its exhilarating and gently-stimulating qualities, it has now become justly acceptable to all classes. Tea has also much contributed to keep under intoxication, and on the same principle on which light wines are here recommended. Coffee has also been useful in the same way, and perhaps tobacco.

It is well known that drunkenness, though once too common, is now rare in the highest classes of society; and this happy change is unquestionably due, in a great measure, to the adoption by them of pure unbrandied wines. Many persons suppose that all wines but Port, Sherry and Madeira, with one or two others, are meagre and acid. There cannot exist a greater delusion. Numerous districts in Europe are both able and of course very willing to supply us with palatable and wholesome wines of low price. These could be sold in England at a rate not beyond the means of the mechanic, and at the same time remunerating to the several dealers,—a rate much below what is too often now bestowed on gin and other vile liquors. A few enterprising wine-merchants, unshackled by the routine and prejudices of trade, might, by a personal examination of the wine countries, introduce to their countrymen an excellent and cheap beverage, and, at the same time, open for themselves a lucrative branch of commerce. The enterprise—the first exertion only—is wanting, and the persevering merchant would truly earn for himself a civic crown. Bottling would probably not be necessary. The wine might be kept for use by the retailer in small casks, and drawn off at once for the consumer like beer. The practice of mixing wine with cold water (as is usual in wine countries) would in time be adopted. It may be said that such wine would not bear the sea voyage: this is altogether untrue, as the experience of many a private importer for domestic use amply proves. The richer classes also would derive much benefit from this commerce, since light wines for them would thus be obtained cheaper and in greater variety. The present uniform duty is not, however, an insurmountable obstacle. As the subject seems well entitled to the attention of our rulers, government might materially forward the end in view by adopting a graduated scale of duties on wine; and should the matter be properly followed up, there can be no doubt that such a change would ere long take place. A uniform duty of 5*s.* 6*d.* per gallon is a great check to the introduction of cheap wines for general consumption. Merchants, under the operation of such a fiscal regulation, naturally enough confine themselves to importing the highest-priced and most noted wines. An *ad valorem* scale is no doubt attended with inconvenience in the collection, but the importance of the desired end renders it well worth while to encounter this, or even a greater, difficulty. There is also another consideration of no small weight. An extension of the wine trade would lead, inevitably and as a thing of course, to a corresponding introduction of our manufactures into the wine countries. This latter object, confessed by all to be so desirable, would be much more readily attained by taking their commoner wines than by all the commercial treaties ever devised.

The use of spirits otherwise than medicinally is of comparatively recent introduction. When something less heavy than malt liquor was looked for, in the progress of wealth and its concomitants, the rum of our colonies and the brandy and hollands so readily smuggled over the Channel from the continent, afforded too ready a resource. French wines required too much room for extensive smuggling, and a perverse policy excluded them in the regular way of commerce. Our own distilleries, too, soon completed the mischief.

It may be said that malt liquor is as good a beverage as can be used. Taken with meals habitually by all classes, and especially by the laborious, it is very salutary, and this is its proper use; but it is not a holiday drink, and when used on such occasions too often stupefies and becomes the cause of as much intoxication as gin itself. Its effects are almost precisely the reverse of those of tea, and this is a pretty good test. In short, in England it has been tried as a preventive of intoxication and found wanting. Tea and coffee, too, be it remembered, though both most excellent in their way, cannot well be used cold, nor without the additions of milk or sugar, or both. Wine requires no addition, or none beyond cold water. It is worth while to quote here the opinions of a man of great practical wisdom in all such matters,—the late Mr. Jefferson, President of the United States. "I am persuaded, that were the duty on cheap wines put on the same ratio with the dear, it would wonderfully enlarge the field of those who use wine, to the expulsion of whiskey. The introduction of a very cheap wine (St. George) into my neighbourhood, within two years' past, has quadrupled in that time the number of those who keep wine, and will ere long increase them tenfold. This would be a great gain to the treasury and to the sobriety of our country."—Jefferson's Mem., &c., vol. iv., p. 78. Again,—"I rejoice as a moralist at the prospect of a reduction of the duties on wine by our national legislature. It is an error to view a tax on that liquor as merely a tax on the rich. It is a prohibition of its use to the middling class of our citizens, and a condemnation of them to the poison of whiskey, which is desolating their houses. No nation is drunken where wine is cheap; and none sober where the dearness of wine substitutes ardent spirits as the common beverage. It is, in truth, the only antidote to the bane of whiskey. Fix but the duty at the rate of other merchandise, and we can drink wine here as cheap as we do grog; and who will not prefer it? Its extended use will carry health and comfort to a much enlarged circle. Every one in easy circumstances will prefer it to the poison to which they are now driven by their government. And the treasury itself will find that a penny a piece from a dozen is more than a groat from a single one. This reformation, however, will require time. Our merchants know nothing of the infinite variety of cheap and good wines to be had in Europe; and particularly in France, Italy, and the Grecian Islands."—Ibid. p. 320.

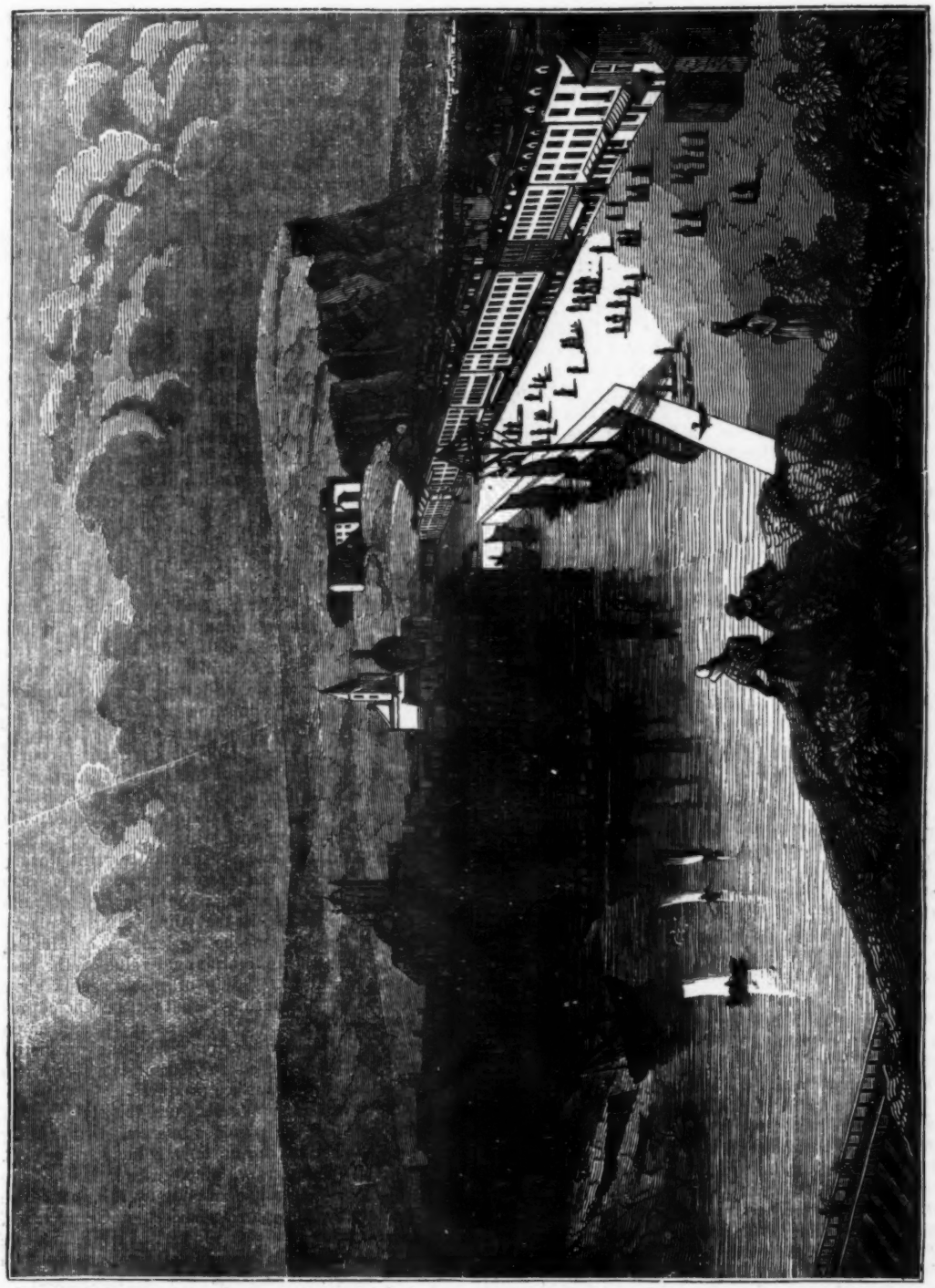
Perhaps the government of a country cannot more effectually discharge its high duties than by a careful attention to such matters; since, according to the way in which they are treated, they become the germ of so much good or evil to all classes. Akin to the same subject is that of relaxations, or amusements generally for the working-class, and that next to them. The abridgment of these things may be carried too far, and probably has been so in this country and in the United States. We reproach the French and some other nations with their fondness for spectacles and diversions. Their meetings, however, are ever accompanied by courteous manners and sobriety,—our own by coarseness, and too frequently by intoxication.

DIEPPE.

DIEPPE is a sea-port town of France, situated between two rocky mountains, at the mouth of the river Arque, which empties itself into the British Channel. In the ancient division of France into provinces, Dieppe belonged to Normandy; but the more recent division into departments renders it one of the towns of the Lower Seine, and the principal place of a district of its own name. It is distant 90 miles N.W. from Paris, and 140 miles S.S.E. from London.

The town is not very ancient, and originated with the fishermen who constructed their cabins at the mouth of the Arque, which afforded an advantageous situation for the prosecution of their employment. It began to figure in history towards the end of the twelfth century, it having been destroyed and its vessels burnt, in the year 1196, by Philip Augustus, during the quarrels between him and Richard Cœur de Lion. The houses seem, however, to have been soon rebuilt, and the other disasters repaired. Previously to the reign of Charles VII., Dieppe, with the rest of Normandy, remained in the possession of the English; but, in the year 1433, it was taken by the French; and although, about nine years after, Talbot besieged it with powerful artillery, his attempts to retake it were rendered abortive by Dunois, who threw himself into the place, and was speedily succoured by the Dauphin, son of Charles VII. In the fourteenth century Dieppe had already become celebrated for its industry and its commerce; and at a later period, under Francis I., it possessed an immense maritime commerce. Ango, the principal of its privateering chiefs, covered the sea with his vessels, and sent armed squadrons, at his own expense, to chastise the powers which had insulted his flag, and treated with their ambassadors as an equal. Some of the most remarkable commercial enterprises of those times emanated from Dieppe. In 1335 the inhabitants fitted out an expedition to the coasts of Africa, where they afterwards built forts and established a considerable trade. France also owed to them its first establishments in Canada, and the foundation of Quebec; and they have the honour of numerous geographical discoveries which we cannot here enumerate. The prosperity of Dieppe underwent a serious interruption in 1694, when it was reduced to ashes by an English squadron, which threw into the town 3000 bombs and 4000 balls. The castle, two churches, and a few houses, alone escaped the effects of this terrible bombardment. The town was, however, shortly rebuilt with the assistance of the government; and the opportunity was taken to give it more regularity and greater uniformity of appearance than it previously possessed.

Notwithstanding the variations of temperature at Dieppe, the air is considered to be generally pure and healthy. The water for common use is abundant and of good quality: there are 68 fountains dispersed through the town, fed by an aqueduct, which is cut in the rock to the extent of upwards of three miles. The town itself is, upon the whole, handsome and well built. The streets, which are wide and straight, are for the most part composed of good and uniform houses, which are generally built with bricks, covered with tiles, and furnished with balconies. The high street, which is more than a mile in length, is particularly worthy of notice. Nevertheless the general effect of the town is spoken of as unpleasing to an English eye. The fronts of the houses are dingy, and the windows disfigured with clothes hung out to dry. The streets, too, are indifferently paved, and are cleaned by gutters which run down the middle with cuts on each side leading to the houses. But these are circumstances not at all peculiar to Dieppe, and are only calculated to strike an Englishman on his first arrival in the country. The town has two suburbs, one of which,



[Dieppe Harbour.]

called Le Paulet, is inhabited principally by fishermen and sailors. The principal ecclesiastical structure is the parish church of St. James, one of those which escaped the bombardment of 1694; it is a fine edifice surmounted by a tower, from which the coast of England can be seen distinctly. There are two other parish churches and a place of worship for Protestants. The place contains two hospitals, a communal college, with a library of 3000 volumes, a navigation school, a theatre, barracks for infantry, &c. Dieppe has a good stone bridge of seven arches: there are several small squares, and the ramparts afford a very excellent promenade. The castle of Dieppe is situated to the west of the town; it occupies a strong and picturesque situation, commanding at the same time the town, the valley, and the sea. Its high walls are flanked with towers and bastions; but it is, taken altogether, an irregular and badly-fortified structure. The harbour is at the opposite or eastern end of the town: it is formed by the mouth of the Arque, and though tolerably commodious, is narrow, not being fitted to contain more than 200 vessels of from 60 to 400 tons burden. It is in the form of a semi-circle, and has a depth of eighteen feet at high water, and is furnished with two very fine moles of strong brick-work, about half a mile in length.

A very excellent establishment of sea-baths was formed at Dieppe in the year 1824. It consists of two distinct parts; the first is an erection upon the beach destined to receive the bathers, forming a gallery about 100 yards in length, decorated at each end with elegant pavilions. The tents placed upon the sand, and the bathing-machines, appertain to this part of the establishment. The other part consists of a hotel, in which are lodgings particularly appropriated to the strangers who frequent the baths and who increase in number every year. In the town, opposite the theatre, there is another establishment, containing hot, cold, and shower baths, of both sea and soft water. This establishment also contains a magnificent hall-room, a fine coffee-room, and a reading-room. There are not, in any country, many towns better provided than Dieppe in facilities for bathing, the importance of which to health and comfort has been hitherto sadly overlooked in this country.

The manufactures and maritime commerce of Dieppe suffered greatly during the last war between this country and France; but a revival has since taken place, though we have no materials estimating to what extent. A great deal of cooper's work is done in Dieppe, barrels being much in demand for the fisheries during the salting-season; there are sugar-refineries, rope-manufactories, and yards for building merchant-vessels. But the principal manufactures of the place are in ivory and lace. The toys, of very superior workmanship and reasonable price, which are manufactured at Dieppe from ivory, horn, and bone, and which have always been considerably in demand, furnish employment to a rather large section of the population. The manufacture of lace is less considerable now than in former times, although the establishment of a school for the manufacture has given activity to this branch of employment. The following particulars relate to the manufacture as it existed previously to the French Revolution; but they are still, we believe, applicable in details though not in extent. In 1788 the manufacture afforded employment to about 4000 married and unmarried females and children, chiefly the wives and daughters of fishermen; and its annual produce was about 18,000*l.* The merchants sold the thread to the women, and paid them for the lace according to its value, which differed from sevenpence-halfpenny to fifteen or sixteen shillings a yard. Common lace consumed, of course, more thread than the fine bone-lace. Thus a yard of fifteen-penny lace would contain ninepennyworth of thread, while a yard of eight or nine shilling lace contained no more than threepennyworth of thread. The inferior workpeople could earn about threepence or fourpence a day at this employment, while the more skilful might get from sixpence to a shilling a day. Small sums these seem; but this was fifty years ago, and in France, where the people can live on less money than here.

It is its fisheries, however, which afford to Dieppe the most important branch of its trade. As it is the nearest sea-port to Paris, and is most advantageously situated for fishing on the coast, the metropolis naturally looks to Dieppe for the principal part of its supply of fish. This circumstance gives great activity to this branch of employment, which occupies a large number of men and vessels. The principal fisheries of Dieppe are those of the herring, whiting, and mackerel. The fish intended for the Paris market are sent off, as soon as landed, in light carts, which travel night and day. In time of peace, there are regular packets between Dieppe and Brighton—a distance of sixty-six miles. This furnishes the most direct of all the routes between London and Paris, and is eighty-seven miles shorter than that by Dover and Calais. In summer, the packets pass almost daily; but, in winter, the inferiority of the harbours on both sides of the channel renders them less frequent than from Southampton to Havre.

The population of Dieppe is commonly estimated at 20,000; but the most recent authority, the 'France Pittoresque,' gives it only 17,079. The town has been the birth-place of several distinguished men, among whom the 'Dictionnaire Geographique Universel' mentions the physician Jean Pecquet, who discovered the *thoracic duct*, to which his name has been given; and Bruzen de la Martinière, the author of 'Le Grand Dictionnaire Geographique.'

MINERAL KINGDOM.—Section XXXIX.

Silver (*continued*).

The richest silver mine at present worked in Mexico is that of Veta Grande, four miles north of Zacatecas, on the table land, at an elevation of 6000 feet above the level of the sea. There is one great vein from eight to thirty feet thick, in different places, but which separates in others into three and four branches. It traverses transition strata, consisting of clay-slate, grauwacke, and limestone, resting on the variety of granite called syenite, and covered occasionally by porphyry. The ores are chiefly native silver and antimonial silver, and yield on an average 3½ ounces of pure metal in the quintal. It produced in 1832 160,000 troy lbs. of silver. Humboldt gives a statement founded on official documents of the produce of the mines of Mexico from 1690 to 1803, which shows that they had been continually on the increase during that period; in the first ten years of it the average annual value of the gold and silver obtained was only 92,000*l.*, but in the last ten years it was 4,800,000*l.*, of which nineteen-twentieths were silver. This increase was owing to a combination of many favourable circumstances; the discovery of new mines, the increased numbers and intelligence of the population, the extension of commercial intercourse with other nations, and the reduction in the price of quicksilver,—an article of indispensable necessity in order to separate the precious metals entirely from the other mineral substances with which they are combined. He reckons that the average annual amount during the first ten years of the present century was little short of 5,000,000*l.* sterling; the quantity of pure silver annually produced in that time being 1,440,650 troy lbs. In treating of the agriculture of Mexico, Humboldt estimates the total annual value of the produce of the land at 29,000,000 of piastres, equivalent to about 6,344,000*l.* sterling; so that the whole produce of the mines, considerable as it is, and upon which, according to a vulgar prejudice, the prosperity of the country is supposed to depend, is a fourth less than the culture of the surface produces.

But it must not be supposed, from this statement of the abundance of the precious metals, that mining adventures in Mexico are universally lucrative or even profitable; on the contrary, nineteen-twentieths of the mines afford together only about one-twelfth part of the gross produce. The three districts of Guanaxuato, Catorce, and Zacatecas alone furnished more than the half, and the vein of Guanaxuato more than a fourth of all the silver. The sums lost by individuals in unfortunate speculations have been immense; on the other hand, there are instances of individuals who got the great prizes in the mining lottery, suddenly acquiring enormous wealth. The proprietors of the mines of Valenciana in the district of Guanaxuato, became in a few years the richest people in Mexico, for the produce was, for a long time, from 80,000*l.* to 120,000*l.* per annum. The Count de Regla drew in twelve years from the mine of Biscaina, in the Real del Monte, above 1,000,000*l.* sterling; the mine of Padreflores in the Real Catorce yielded 320,000*l.* clear profit the first year it was worked. The mine of Veta Grande, above-mentioned, yielded on an average of

the three years ending December, 1831, 150,000 troy lbs. of silver, and netted to the proprietors 176,000*l.*, or a profit of 185 per cent. on the capital invested. In the year 1832 the silver produced was 180,000 lbs. troy, and the profits were 196,000*l.*; in 1833 it was considerably less, but in 1834 it had again augmented, so that there was every appearance that it would turn out nearly as great as that of 1832*.

South America.—When Pizarro landed in Peru in 1527, he found silver mines worked in several of the provinces, and the metal in very general use. "There are now mines in Peru along the whole range of the Andes, from Caxamarca to the confines of the desert of Atacama; but the richest are those of Pasco, in the eleventh degree of latitude, which have been worked since the year 1630. Here, as well as in other situations in Peru, the greatest part of the silver is obtained from the ore called *pacos*. To form a just idea of the enormous quantity of silver in some of these mountains, it is only necessary to state, that in the mines of Pasco the ore has been worked without intermission since the beginning of the seventeenth century; and that in twenty years preceding 1803, no less than 3,086,420 troy lbs. of silver had been obtained from them, and that too without in any case sinking deeper than about seventy fathoms, while most of the mines do not exceed fifteen fathoms in depth. The stratum of limestone in which the ore is contained lies exposed at the surface over an area of three miles by a mile and a half. The mines of Chota are also very productive. They are situated in the mountain of Gualgayoc, at an elevation of 13,300 feet, where the thermometer in summer descends every night to the freezing point. The ore lies quite at the surface, so that in removing the turf almost in any place, over an extent of half a square league, portions of sulphuret of silver and filaments of native silver may be met with adhering to the roots of the grass. The ore is richer than that of Pasco, and yielded on an average of twenty-eight years prior to 1803, 41,477 troy lbs. of silver annually. In the district of Arica, on the very borders of the Pacific, at Huantajaya, there are mines of silver which are celebrated on account of the very large masses of pure solid silver sometimes found there, one of which weighed 800 lbs. The most renowned of all the silver mines of South America are those of Potosi in Upper Peru. They are situated in a lofty mountain called the Cerro del Potosi, composed of clay-slate covered by porphyry, and rising to the height of 16,000 feet above the sea, the town of Potosi itself being 2700 feet below the summit."—('*Penny Cyclopædia*,' Art. Andes.) According to Herrera the silver was discovered in 1545 by an Indian hunter, who in pulling up a shrub, observed filaments of pure silver about the roots. On examination the mass was found to be enormous, and a very great part of the population was thereby drawn to the spot and employed in extracting the metal. A city soon sprung up, though in a district of unusual sterility. The produce at first was comparatively small, from the ignorance of the miners: but after they found out the method of extracting the silver from the ore by the process of amalgamation, which was brought to Peru from Mexico in 1557, it rapidly increased. It is estimated that the average annual produce from 1556 to 1578 was not less than a sum equal to 440,000*l.* In the next twenty-one years it fell off, the annual amount being only 280,000*l.* It continued to yield a comparatively small produce from its former state, for in the last fifteen years of the eighteenth century its average annual produce was only 116,660*l.* The political disturbances in the last twenty-five years have seriously injured this once opulent district. Captain Andrews, who visited it in 1826, says that, from a population of 130,000 at the commencement of the revolution, it had dwindled down to 11,000; that at one period there were 132 stamping mills for breaking the ore, but that when he was there only twelve were employed; and Sir Edward Temple, who visited Potosi about the same time, says that all the mines put together do not produce 123,400 troy lbs. of silver annually, or about 30,800*l.* in value. There are silver mines in the province of La Paz, in the ancient viceroyalty of Buenos Ayres, which yielded at the time Humboldt wrote, nearly 800,000*l.* annually. Silver is found in Chili, but the mines are in general not very productive. There are veins of silver in several parts of Columbia, but no mines have yet been found sufficiently productive to pay the expense of working them.

With regard to the future prospects of the mines of South America and Mexico, Humboldt, at the time he published his valuable works on that country, was of opinion that they had by no means attained their maximum produce, but would probably become more productive. That as the chain of the Andes, including their continuation into Mexico, is so extensive, and the ores of the precious metals are so generally diffused in them, there must be many places which have escaped the searches of the miners; and there are, besides, several mining grounds that are as yet worked but a little way below the surface. The most productive mines were discovered two centuries and a half after the Spaniards got possession of the country. The system of mining operations is, besides, radically defective in every branch; and if the same skill and economy were introduced, as are practised in the best mining districts of Europe, the increase of produce from that cause alone would be immense.

* For the particulars respecting the Veta Grande, we are indebted to Mr. Frederick Burr, to whom we acknowledged our obligations for similar information respecting the united copper mines in Cornwall.

MACHINE DE MARLY.

"The heroes of poetry are represented as obtaining the assistance of the gods in the performance of their great achievements, but Louis the Great, alone, and without the aid of fiction, was able to force a great river like the Seine to quit its natural boundaries, and to rise over the summit of a mountain, for the supply of one of his palaces." Such is the flourish with which Belidor, one of the most eminent mechanicians of the early part of the last century, introduces a description of the Machine de Marly, an hydraulic engine of enormous size and great complication, which carried to Versailles a quantity of water, equal to about the twentieth part of that supplied to London by the New River Company. Much of the praise bestowed by Belidor may be, without doubt, attributed to the excessive adulation which it was then the fashion to pour out upon Louis XIV., to whose patronage the Machine de Marly owed its existence, but much also was given to the machine itself, which although it is now called "a monument of magnificence and ignorance," and would be surpassed in efficiency by one of our large steam-engines, was probably in its day a first-rate effort of power, and might have been, as Belidor says it was, "the admiration of all Europe."

This machine is, or rather was, situated upon the Seine, about twelve miles from Paris, close by a little village called La Chaussée, within a pleasant walk of the town of St. Germain. It was erected, in the year 1682, by a mechanic named Rannequin, a native of Liége. It took up the whole width of the river, completely stopping all navigation in that part of its course, and compelling the adoption of a canal, which was subsequently cut for the passage of barges.

A very elaborate and accurate account of this machine is given by Belidor, which would be quite unintelligible without the aid of the plates which accompany

his work. A general idea may be gained from the following description:—The whole breadth of the river is divided by piles into fourteen distinct water-courses. In each of these divisions there was a large water-wheel, much like those of the old London Bridge water-works, which may be remembered by many of our readers. Cranks attached to each of these wheels gave motion either to a set of chains, or to forcing pumps. By six cranks out of the fourteen sixty-four such pumps were driven, and their action forced a part of the water of the river through several large iron-pipes up the side of a hill which comes down nearly close upon the bank of the river, and rises to a perpendicular height of about 500 feet, at a distance of three-quarters of a mile. But these sixty-four pumps did not send the water to the top of the hill at once, as might be imagined: the engineer, either distrusting the strength of his pipes, or ignorant of the theory of mechanics, was satisfied with propelling the water at first to a height of only 160 feet, and to a distance of 200 yards from the river, where it flowed into a reservoir dug in the side of the hill, sufficiently large to contain it until sent forwards still further. Here eighty forcing pumps performed the same operation on the water in the reservoir, sending it 500 yards further to a perpendicular height of 350 feet, to be again driven by eighty other pumps as much higher, and to a still greater distance, to the top of a tower built upon the summit of the hill, whence it begins its descent to the place of its destination. The working of these pumps on the side of the hill constitutes the most unscientific portion of the machine. Instead of being placed below, near the power which sets them in motion, they are moved by a long succession of iron rods and chains, which are conveyed up the ascent of the hill at a distance of almost 1000 yards. The manner in which all this is done may be understood by conceiving a man working a pump at 1000 yards distance from the place where he stands: in order to be able to push and pull the pump-handle, he has some hundreds of iron-rods jointed together, and connected at the further end with the handle. When he pulls the end of the rod next him he of course pulls the whole line of rods, and works the pump; when he pushes back again, the line of bars may be retained in a strait position, by rods connected at one end with the joints of the bars, and fastened at the other to a rail fixed to the ground. He thus succeeds in working the pump, but he has also some hundredweight of iron to move at each motion of the pump; and when, as in the case of the Machine de Marly, the shafts are conveyed up the side of a hill, he has all that weight of iron to push up at every rise of the pump-handle. When the writer witnessed the action of the machine about twenty years ago, the sound was like that of a number of waggons loaded with bars of iron, running down a hill with axles never greased. The creaking and clanking must have convinced the most ignorant person that the expenditure of power was enormously beyond what was required for the purpose effected. It has been estimated that 95 per cent. of the power used is employed in moving those unwieldy shafts.

Such is the manner in which the water is raised to the brow of the hill, and to the summit of the tower which is erected upon it, at the commencement of a row of thirty-six large arches, upon the top of which it begins to descend. This is by far the most beautiful feature of the whole work: from its conspicuous situation and fine effect it forms a prominent part of the landscape as seen from St. Germains, and the pleasant villages in its neighbourhood. The beauty of this aqueduct is more to be admired than its utility; for a continuation of the water-pipes to the actual summit, which lies back at a short distance from the brow of the hill, as seen from the river, would have carried the water to the required height without any additional expenditure of power: whereas, by the present costly aqueduct, the water rises to the top of the towers only to flow to the summit of the hill.

The first cost of the Machine de Marly was about 8,000,000 livres, or more than 300,000*l.* sterling; and its annual expense, including working, superintendence, and repairs, about 80,000 livres. Taking the mean produce of the machine to be 36,000 gallons per hour, the water is delivered at a cost of about one farthing per 100 gallons, without taking into the account the cost of its erection; but if we include the interest of that sum at five per cent., the cost of the water will be three-halfpence for that quantity.

The evil of working the pumps with shafts and chains at such great distances from the power acting upon them, was seen within a few years after the machine was completed; and in 1738 an attempt was made by Mr. Camus to raise the water to the top of the tower by a single lift. The attempt succeeded but partially, and the machine was much strained by the extraordinary effort, chiefly because only a small portion of its powers were used, namely, only that part of it intended to throw the water into the first reservoir; the other parts of the machine, which moved the shafts and chain abovementioned, not being applicable for the purpose. But even this comparatively small force raised the water to the foot of the tower, and thus demonstrated the practicability of completing the work at one throw, if the other parts of the machine should be adapted accordingly. Nothing more, however, was done for nearly forty years, and the machine proceeded as before. In 1775, another trial of the power of the machine was made, but this time it was only to raise the water to the second reservoir; this succeeded, and a plentiful supply of water reached the reservoir. It was now hoped that the first reservoir at least would be dispensed with; but many of the old pipes burst from the undue strain upon them, financial difficulties impeded their renewal, and the old plan was once more resorted to. The machine at last fell into decay, and was replaced by a steam-engine of sixty-four horse-power, the finest work in existence, according to Soy, who relates the following anecdote on the subject:—

"Versailles being on the point of wanting water, Napoleon sent for the chief engineer and some learned members of the Institute, and inquired of them what was the best hydraulic machine?

"'Sire, that depends on circumstances.'

"'That is not the question:—what is the best hydraulic machine?'

"'But, Sire, if Nature supplies the moving power—'

"'That is not my question:—what is the best hydraulic machine?'

"'Sire, taking the question abstractedly, the steam-engine.'

"'Make me a steam-engine, and let us hear no more about it.'"

The machine was made at an expense of 2,500,000 francs (about 100,000*l.*), and it consumes 640 lbs. of coal per hour. We must add to this anecdote of Soy that, although the power was changed, the old pipes, reservoirs, shafts, and chains, remain in all their imperfections. The only improvement that we are aware of is, that the pipes, which, some years ago, formed an unsightly object above the ground, are now concealed by being sunk some inches beneath the surface, and such parts as have decayed are renewed or repaired.

, The Office of the Society for the Diffusion of Useful Knowledge is at 59, Lincoln's Inn Fields.

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